

## Public Health

"The neglected tropical diseases (NTDs), a group of chronic, debilitating, and poverty-promoting parasitic, bacterial, and some viral and fungal infections, are among the most common causes of illness of the poorest people living in developing countries." <sup>a</sup>

Abiotic environmental factors are important in determining the distribution of disease-causing vectors and their life-cycles.

Temperature  
Precipitation  
Relative humidity  
Solar radiation  
Topography  
Soil moisture

Presence & extent of fresh water rivers, ponds, lakes

Biotic factors – ecosystem structure and health  
Human factors- Land use, social-economic



WHO is currently focusing on **14** neglected tropical diseases:

- Buruli ulcer
- Chagas disease
- Cholera/Epidemic diarrhoeal diseases
- Dengue/dengue haemorrhagic fever
- Dracunculiasis (guinea-worm disease)
- Endemic Treponematoses (yaws, pinta, endemic syphilis...)
- Human African trypanosomiasis
- Leishmaniasis
- Leprosy
- Lymphatic filariasis
- Onchocerciasis
- Schistosomiasis
- Soil-transmitted helminthiasis
- Trachoma

b

### Major NTD Target Sub-Regions and Unique Ecologies.

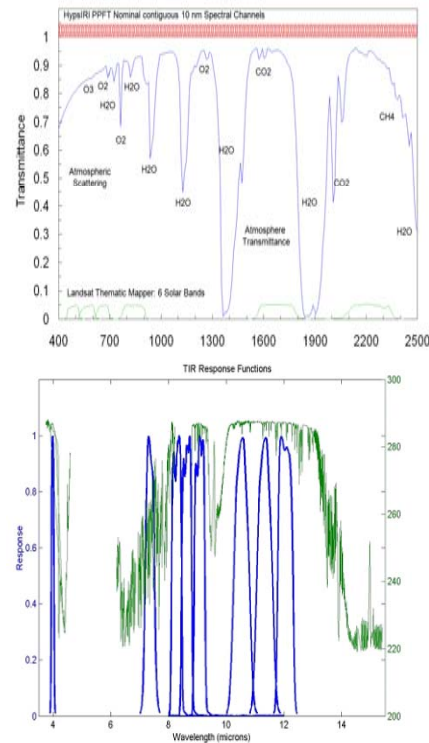
| Scenario | Sub-Region                            | NTDs                                                                                                                     | Indigenous Populations | Co-Factors <sup>a</sup>                                                         |
|----------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------|
| 1        | Southern cone of South America        | Chagas, leishmaniasis, cysticercosis, echinococcosis, hemorrhagic fevers                                                 | +                      | Cattle ranching, minifundios, urban migration                                   |
| 2        | Chaco (Bolivia, Paraguay, Argentina)  | Chagas, leishmaniasis, STH                                                                                               | +++                    | Cattle ranching, minifundios, animal husbandry                                  |
| 3        | Andean region (Altiplano or Highland) | Fascioliasis, Chagas, leishmaniasis, plague, bartonellosis, STH, cysticercosis, echinococcosis, ectoparasites            | ++++                   | Minifundios, urban migration                                                    |
| 4        | Amazonian basin                       | Chagas, leishmaniasis, STH, onchocerciasis, leprosy, trachoma, ectoparasites                                             | ++                     | Deforestation, mining, guerrillas, urban migration, indiscriminate colonization |
| 5        | Eastern Brazil                        | STH (esp. hookworm) schistosomiasis, Chagas disease, leishmaniasis, LF (NE only), echinococcosis, leprosy, leptospirosis | ++                     | Cattle ranching, deforestation, minifundios, urban migration, monoculture       |
| 6        | North Pacific of South America        | STH, cysticercosis, leishmaniasis, onchocerciasis, echinococcosis                                                        | ++                     | Deforestation, gold mining, guerrillas                                          |
| 7        | Caribbean basin                       | STH, schistosomiasis, LF, leprosy, leptospirosis, fascioliasis                                                           | +                      | Economic dependence on tourism, deforestation, urban migration                  |
| 8        | Central America and Panama            | STH, leishmaniasis, Chagas, onchocerciasis, cysticercosis, leptospirosis                                                 | +++                    | Deforestation, desertification, migration                                       |
| 10       | South and Central Mexico              | STH, Chagas, cysticercosis, leishmaniasis, trachoma, onchocerciasis                                                      | +++                    | Deforestation, migration                                                        |
| 11       | Northern Mexico                       | STH, Chagas, cysticercosis, leishmaniasis                                                                                | ++                     | Desertification, migration                                                      |

<sup>a</sup>Hotez PJ, Molyneux DH, Fenwick A, Kumaresan J, Ehrlich Sachs S, et al. Control of neglected tropical diseases. *New Eng J Med*. 2007;357:1018–1027.

<sup>b</sup>P. J. Hotez, M. E. Bottazzi, C. Franco-Paredes, S. K. Ault, and M. R. Periago. 2008 The Neglected Tropical Diseases of Latin America and the Caribbean: A Review of Disease Burden and Distribution and a Roadmap for Control and Elimination. *PLoS Negl Trop Dis*. 2008 September; 2(9): e300.

## The Hyperspectral Infrared Imager (HyspIRI) Public Health & Air Quality Applications

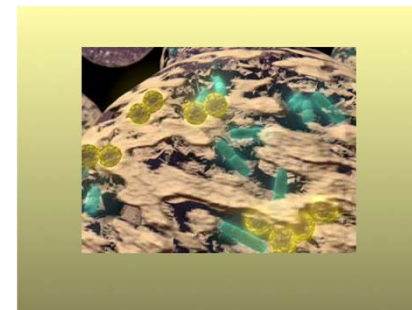
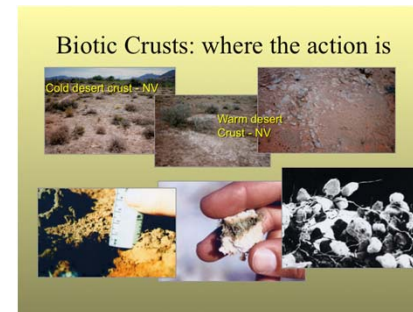
Jeffrey C. Luvall <sup>1</sup> & Simon J. Hook <sup>2</sup>  
Marshall Space Flight Center <sup>1</sup> & Jet Propulsion Laboratory <sup>2</sup>



## Air Quality (Dust)<sup>c</sup>

HyspIRI hyperspectral measurements would provide global measurements of surface mineralogy and biotic crusts important in accessing the impact of dust in human health.

HyspIRI surface thermal measurements would also help identify the variability of dust sources due to surface moisture conditions and map mineralogy

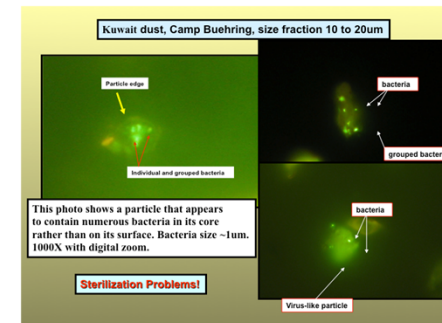


Middle East Dust – Trace Composition

Links between selected elements and some known lung function conditions and diseases

|                                 | Desert Dust <10 µm | Desert Dust 20-40 µm |
|---------------------------------|--------------------|----------------------|
| Mn (ppm)                        | 450                | 331.98               |
| Fe (ppm)                        | 25500              | 18111.61             |
| Ca (ppm)                        | 11.72              | 8.24                 |
| Pb (ppm)                        | 17.22              | 9.45                 |
| Cu (ppm)                        | 220                | 152.64               |
| Cd (ppm)                        | 1.24               | 0.70                 |
| Mg (ppm)                        | 13230.49           | 10572.70             |
| Al (ppm)                        | 15912.39           | 13154.60             |
| Ca (ppm)                        | 139577.64          | 140250.15            |
| Na (ppm)                        | 1098.28            | 1476.86              |
| Cy (ppm) (but species critical) | 181.32             | 187.36               |
| Zn (ppm)                        | 105.18             | 72.30                |
| Ni (ppm)                        | 93.28              | 60.44                |
| Ti (ppm)                        | 1095.52            | 539.81               |

Cancer Cancer suspected Cancer & asthma Emphysema Asthma



<sup>c</sup> Used with permission of Dr. Mark B. Lyles VADM Joel T. Boone Chair Of Health And Security Studies Center For Naval Warfare Studies U.S. Naval War College Newport, Rhode Island Mark.Lyles@usnwc.edu